

4510

COLOR GRAPHICS RASTERIZER



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4510 Color Graphics Rasterizer Operators Manual

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COLOR GRAPHICS RASTERIZER

First Printing SEP 1984

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WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested to comply with the limits for Class A computing devices pursuant to Subpart J or Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the users at their own expense will be required to take whatever measures may be required to correct the interference.

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MANUAL REVISION STATUS

PRODUCT: 4510 Color Graphics Rasterizer

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REV DATE	DESCRIPTION
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OPERATORS SAFETY SUMMARY

This general safety information is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

IN THIS MANUAL

CAUTION statements identify conditions or practices that can result in damage to the equipment or other property.

WARNING statements identify conditions or practices that can result in personal injury or loss of life.

AS MARKED ON EQUIPMENT

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

IN THIS MANUAL



This symbol indicates where applicable cautionary or other information is to be found.



Static-Sensitive Devices.

AS MARKED ON EQUIPMENT



DANGER high voltage.



Protective ground (earth) terminal.



ATTENTION — refer to manual.



Refer to manual.

POWER SOURCE

This product is designed to operate from a power source that does not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

GROUNDING THE PRODUCT

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the power input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

DANGER ARISING FROM LOSS OF GROUND

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

USE THE PROPER POWER CORD

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

Refer cord and connector changes to qualified service personnel.

USE THE PROPER FUSE

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

DO NOT OPERATE IN EXPLOSIVE ATMOSPHERES

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

DO NOT REMOVE COVERS OR PANELS

To avoid personal injury, do not remove the top covers. Do not operate the product without the covers and panels properly installed.

Section 1

INTRODUCTION

ABOUT THIS MANUAL

This manual introduces you to the TEKTRONIX 4510 Color Graphics Rasterizer. The material covers the features and operating capabilities of the rasterizer from a typical operators viewpoint. The organization is as follows:

Section 1	Contains introductory information about the rasterizer's features, functions, and compatibility.
Section 2	Provides a familiarization procedure for first time operation. (Section 4 gives the full description of operation.)
Section 3	Discusses all external controls, indicators, and connectors.
Section 4	Serves as a reference section for examining or changing the four interface ports and their communication parameters. Includes power-up and verification test procedures and discusses error detection.
Appendices	Includes reference data on options, accessories, unpacking, installation, and specifications.

RELATED DOCUMENTATION

The following manuals provide additional documentation on the 4510 Color Graphics Rasterizer (see Appendix A for part numbers).

- *4510 Reference Guide*
- *4510 Programmers Reference Manual*
- *4510 Service Manual*

GENERAL DESCRIPTION

RASTERIZER OVERVIEW

The 4510 rasterizer is a stand-alone microprocessor-controlled peripheral that connects between a host (or intelligent terminal) and the TEKTRONIX 4691 or 4692 Color Graphics Copier. The rasterizer converts high level graphics commands from the host device into high resolution raster information for the copier. This provides full resolution output from the color graphics copier.

RASTERIZER FEATURES

Following is a brief summary of the main features of the rasterizer. Refer to "Related Documentation" (and elsewhere in this manual) for further information about any of these features.

Multiple Input Ports

The rasterizer has a standard 4-channel multiplexed RS-232 ASCII interface that makes it easy to interconnect the copier with up to four hosts or workstations. The operator may use any port. Busy signaling (flagging) to non-involved hosts is available.

Selectable Input Port Parameters

The rasterizer features operator-selectable parameters for the input ports. Selectable features include:

- Selectable data input/output rates from 75 to 19200 baud or external clock
- Split input/output data rates
- Selectable output (transmit) parity
- Selectable software flagging ((XON/XOFF) – None, TRANSMIT, RECEIVE, or Both
- Selectable (transmit) data byte stop bit selection

High Resolution

The rasterizer produces the maximum resolution commensurate with the picture size.

Color Selection

The rasterizer handles seven solid colors. With color dithering, the total increases to 256 color patterns at one time. The rasterizer expands the color palette for the 4691 and 4692 Color Graphics Copiers by supporting over 274,625 colors and shades (hues).

Copy Orientation

Either portrait or landscape image orientation is selectable.

Selectable Character Fonts

The character sets installed are ASCII (North American), United Kingdom, Swedish, Danish/Norwegian and German. These are selectable through the 4100-style input commands (see the *4510 Programmers Manual*).

COMPATIBLE HOSTS

The rasterizer accepts up to four host computers or intelligent terminals using the four RS-232 input connectors on the rear panel. The rasterizer appears as a "terminal" with respect to the host.

COMPATIBLE COPIERS

The rasterizer has one 36-pin parallel interface port. The output is compatible with the TEKTRONIX 4691 and 4692 Color Graphics Copiers.

Section 2

FIRST-TIME OPERATION

PURPOSE AND SCOPE

Using the familiarization procedures in this section as a first-time operation acquaints you with the rasterizer's front and rear panel controls and performs a functional check.

These procedures provide familiarity with many of the command sequences and with the rasterizer's actions in response to those commands. However, this manual does not provide with these procedures a detailed explanation of all the commands. Refer to the *4510 Programmers Reference Manual* for a full description of host commands.

NOTE

After an initial system installation, you normally do not need to access the rear panel switches except to change the rasterizer's baud rate, parity, flagging, or stop bit parameters.

FAMILIARIZATION PROCEDURES

These procedures assume the rasterizer's proper installation according to the instructions in Appendix B (*Unpacking and Installation*). The rasterizer should be connected to and set for a suitable line voltage source and the front panel POWER switch should be OFF. Figure 2-1 shows the location of the front and rear panel switches and indicators.

NOTE

You do not need to connect the rasterizer to either a host or a terminal to perform the following procedures.

POWER UP THE RASTERIZER

Press the front panel POWER switch. The following sequence of events occurs:

- A yellow-green indicator in the switch becomes visible.
- The three front panel indicators (RECEIVE, BUSY/XMIT COPY, and FAULT) flash several times and then the BUSY/XMIT COPY indicator remains on approximately 40-65 seconds.

NOTE

The exact length of time that the BUSY/XMIT COPY indicator remains on depends upon the amount of memory installed in the rasterizer. Refer to the "Display List Options" (Table A-1) in Appendix A.

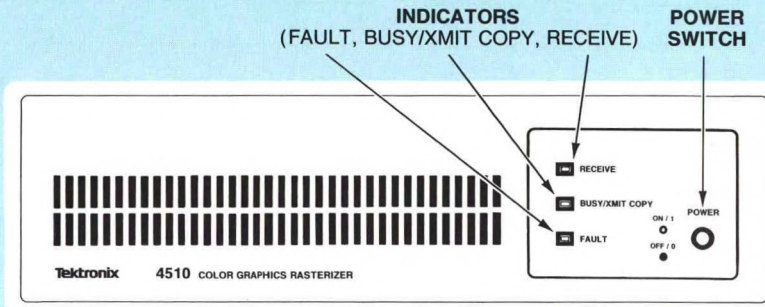
- During the power-up sequence (while the front panel BUSY/XMIT COPY indicator is on), the VERIF TEST indicator on the rear panel is lit.
- The PORT indicators on the rear panel flash in sequence when the ports are being verified.
- During the power-up sequence (while the front panel BUSY/XMIT COPY indicator is on), the STATUS INDICATOR displays a two-digit code to indicate that the internal automatic test is in progress at that moment.

After approximately 40-65 seconds, the front panel BUSY/XMIT COPY indicator and the rear panel STATUS INDICATOR and VERIF TEST indicator turn off. The rasterizer is now idle and awaiting further instructions.

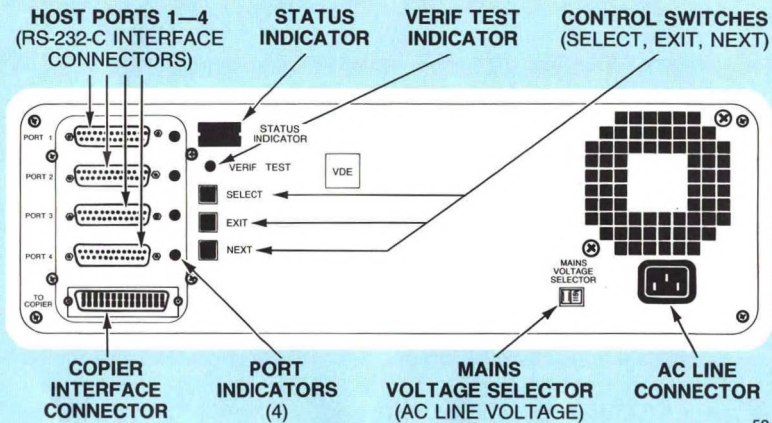
NOTE

If an internal failure is detected during the power-up sequence, the front panel FAULT indicator turns on and the STATUS INDICATOR displays the code of the failed test.

A. Front Panel.



B. Rear Panel.



5040-2

Figure 2-1. Front and Rear Panel Switch and Indicator Locations.

SELECT A COMMUNICATIONS PORT

You select one of the four RS-232-C interface communication ports by doing the following steps:

1. Press the SELECT switch once. The front panel's BUSY/XMIT COPY indicator turns on and the rear panel VERIF TEST indicator starts blinking. This indicates that the rear panel is active.
2. Press the NEXT switch. The blinking VERIF TEST indicator turns off and the PORT 1 indicator starts blinking. Also, the STATUS INDICATOR displays the characters 1C.

NOTE

The second digit (C) indicated for these steps may differ from that of your rasterizer if the instrument was previously installed in a system. The second digit takes on values other than a C. For the purpose of this procedure, the second digit gives the factory-set parameter values.

The first digit (1 in this case) indicates the selection of the transmit/receive baud rate function; the second digit (C in this case) refers to the actual baud rate code. As shown in Table 4-2 of Section 4 (*Operation*), C indicates a baud rate of 9600.

3. Press the NEXT switch four more times. Notice that each time you press the NEXT switch, the next PORT indicator (in sequence) starts blinking and the PORT indicator that previously blinked turns off. Since you started with PORT 1 (the top port connector and indicator on the rear panel), the process of pressing NEXT four times (after Step 2) steps you by PORTS 2, 3, and 4 and returns you to PORT 1.

NOTE

At this point you could press SELECT, NEXT, or EXIT, depending on whether you want to examine/change the parameter values, go to the next port, or exit and save the parameter values displayed in the STATUS INDICATOR, respectively.

The STATUS INDICATOR shows the corresponding baud rate setting for each PORT at the time that the examined port's indicator is blinking.

4. Press the SELECT switch. This selects PORT 1, and causes the indicator light for that port to come on. The STATUS INDICATOR's first (left) digit zone blinks the code character (1) of the first parameter (baud rate).

EXAMINE THE BAUD RATE

The previous steps selected PORT 1. The first digit of the STATUS INDICATOR now blinks (1 = baud rate parameter code, per Table 4-2), while the second digit (the baud rate value code of C) is displayed steadily. The C indicates the current baud rate setting (9600). This is how to examine the baud rate for this port.

CHANGE THE BAUD RATE

1. Press the SELECT switch. The first digit (parameter code 1) is now displayed steadily while the second digit (the baud rate value code) begins to blink. Refer to Table 4-2 for a table of baud rates and their value codes).
2. Remember the present displayed baud rate value code (second digit) and repeatedly press the NEXT switch. Each time the NEXT switch is pressed, a new baud rate value code appears (blinking) in the second digit of the STATUS INDICATOR. Keep pressing the NEXT switch until the remembered value appears.

If the rasterizer is being installed in a system, use the baud rate value code for the baud rate that will be used in the system.

3. Press SELECT. This selects the displayed baud rate value code. If this value is different from the remembered value, the new value becomes the baud rate for Port 1. After pressing SELECT, the second digit is displayed steadily (is selected) and the first digit starts blinking (can be examined/selected again if desired).

EXAMINE THE PARITY

Press the NEXT switch. The STATUS INDICATOR will display a blinking first digit (2 = parity, see Table 4-2) while the second digit (the parity value code of 0) is displayed steady. This is how to examine the parity for this Port.

CHANGE THE PARITY

1. Press the SELECT switch. The first digit (parameter code of 2) is now displayed steady while the second digit (the parity value code) begins to blink. Refer to Table 4-2 for a table of parities and their value codes).
2. Remember the present displayed parity value code (second digit) and repeatedly press the NEXT switch. Each time the NEXT switch is pressed, a new parity value code appears (blinking) in the second digit of the STATUS INDICATOR. Keep pressing the NEXT switch until the remembered value appears.

If the rasterizer is being installed in a system, use the parity value code for the parity that will be used in the system.

3. Press SELECT. This selects the displayed parity value code. If this value is different from the remembered value, the new value becomes the parity for PORT 1. After pressing SELECT, the second digit is displayed steady (indicating selection) and the first digit starts blinking (indicating that the "examine/select" process can be repeated if desired).

EXAMINE THE FLAGGING

Press the NEXT switch. The STATUS INDICATOR will display a blinking first digit (3 = flagging, see Table 4-2) while the second digit (the flagging value code of 1) is displayed steady. This is how to examine the flagging for this Port.

CHANGE THE FLAGGING

1. Press the SELECT switch. The first digit (parameter code of 3) is now displayed steady while the second digit (the flagging value code) begins to blink. Refer to Table 4-2 for a table of flagging parameter values and codes.
2. Remember the present displayed flagging value code (second digit) and repeatedly press the NEXT switch. Each time the NEXT switch is pressed, a new flagging value code appears (blinking) in the second digit of the STATUS INDICATOR. Keep pressing the NEXT switch until the remembered value appears.

If the rasterizer is being installed in a system, use the flagging value code for the flagging that will be used in the system.

3. Press SELECT. This selects that flagging value code. If this value is different from the remembered value, the new value becomes the flagging for PORT 1. After pressing SELECT, the second digit is displayed steady (is selected) and the first digit starts blinking (can be examined/selected again if desired).

EXAMINE THE STOP BITS

Press the NEXT switch. The STATUS INDICATOR will display a blinking first digit (a 4 = stop bits, see Table 4-2) while the second digit (the stop bits value code of 1) is displayed steady. This is how to examine the stop bits for this Interface Communication Port.

CHANGE THE STOP BITS

1. Press the SELECT switch. The first digit (parameter code of 4) is now displayed steady while the second digit (the stop bits value code) begins to blink. Refer to Table 4-2 for a listing of stop bits and their value codes.
2. Remember the present displayed stop bits value code (second digit) and repeatedly press the NEXT switch. Each time the NEXT switch is pressed, a new stop bits value code appears (blinking) in the second digit of the STATUS INDICATOR. Keep pressing the NEXT switch until the remembered value appears.

If the rasterizer is being installed in a system, use the stop bits value code for the number of stop bits that will be used in the system.

3. Press SELECT. This selects that stop bits value code. If this value is different from the remembered value, the new value becomes the number of stop bits for PORT 1. After pressing SELECT, the second digit is displayed steady (is selected) and the first digit starts blinking (can be examined/selected again if desired).
4. Press NEXT. The STATUS INDICATOR will go back to the baud rate parameter (show a blinking 1 and a steady second digit). We have gone through all of the examination/change procedures for the parameters on PORT 1.
5. Press EXIT. This ends the rear panel examination procedure and turns off the front panel's BUSY/XMIT COPY indicator and the rear panel's PORT 1 indicator.

NOTE

If desired, the parameters for interface communication PORT 2, 3, or 4 may be examined/changed in the same manner by returning to Step 1 of the "Select a Communications Port" procedure and repeating the above procedures to this point.

This completes the basic familiarization procedures for the rasterizer. Section 3 (*Controls, Indicators, and Connectors*) fully describes the front and rear panels of the rasterizer. Section 4 (*Operation*) gives more detailed information on the operation of the rasterizer.

Section 3

CONTROLS, INDICATORS, AND CONNECTORS

INTRODUCTION

This section describes the locations and functions of all the controls, indicators, and connectors on the TEKTRONIX 4510 Color Graphics Rasterizer. The procedures for using them appear in Section 4 (*Operation*); but Section 2 (*First Time Operation*) provides a short, step by step, familiarization procedure.

FRONT PANEL SWITCH AND INDICATORS

Figure 3-1 locates the front panel's power switch and three indicators described below.

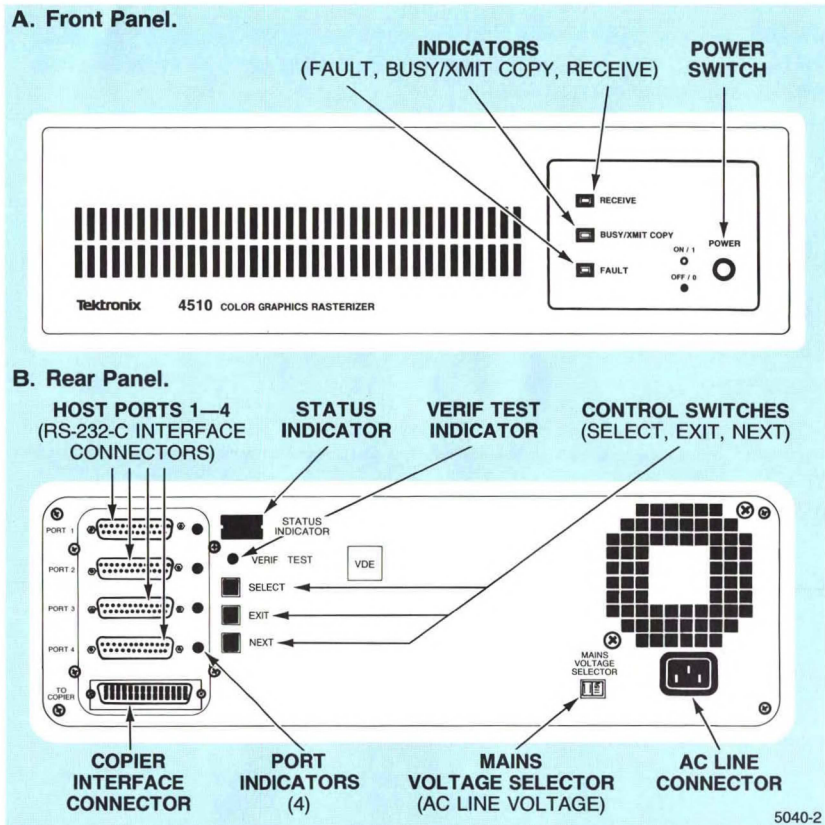


Figure 3-1. Front and Rear Panel Switch and Indicator Locations.

POWER SWITCH

The POWER switch is a self-indicating switch that controls the ON/OFF condition of the rasterizer. When the power to the rasterizer is ON, the switch shows green; when the power is OFF, the switch is black.

RECEIVE INDICATOR

The RECEIVE indicator is a yellow light-emitting diode (LED) that turns on whenever the active port receives a byte. It turns off within one half second later, if the port receives no more bytes. The RECEIVE light is off at all other times, except momentarily during power-up and when tested in service mode.

BUSY/XMIT COPY INDICATOR

The BUSY/XMIT COPY indicator is a yellow LED that turns on during the time the processor is "pixelating" the input data and blinks during the time that data is being sent to the color copier. The LED turns on during any back panel activity, and during the power-up, verification, and service tests. The first byte from the active host port turns on the LED. It stays on if the port is reserved. It is off only when the rasterizer is idle, and not reserved.

NOTE

If the pixelation of data being sent to the color copier is not complex, the BUSY/XMITCOPY LED blinks throughout the copy session; if the pixelation is complex, the LED glows momentarily to indicate an interruption of the copy session during the complex pixelation.

FAULT INDICATOR

The FAULT indicator is a red LED that flashes during the power-up sequence, then turns off to indicate readiness for normal operation. However, the LED remains on if the rasterizer's internal power-up testing programs detect a device error.

REAR PANEL CONTROLS, INDICATORS, AND CONNECTORS

The following descriptions define the rear panel controls, indicators, and connectors, in that order. See Figure 3-1.

REAR PANEL CONTROLS

The rasterizer rear panel has three control switches with which to set communication parameters or to select tests, and a voltage selector. They are:

- SELECT switch
- EXIT switch
- NEXT switch
- MAINS VOLTAGE SELECTOR switch

NOTE

Since the SELECT, EXIT, and NEXT switches interrelate functionally, the operator uses them together. See Section 4 for detailed procedures (or Section 2 for a brief orientation).

SELECT Switch

The SELECT switch has two basic functions:

1. One function is the activation of the rear panel to examine or change any operator-selectable parameter (including baud rate, parity, stop bits, and flagging) for any of the four interface ports. Pressing the SELECT switch **once** activates the rear panel. (Pressing the SELECT switch a **second time** runs a series of internal diagnostic tests).
2. The other basic function is the selection of a port, a parameter, or a parameter value. To make these selections requires using the NEXT switch to review the available ports, parameters, and values before pressing the SELECT switch. See Section 4 for specific procedures.

EXIT Switch

The EXIT switch, when pressed, deactivates the rear panel and saves in memory the current state of all parameters for the selected port (even if the power is turned off later).

You can use the EXIT switch to simulate host commands under the following conditions: When a port LED is lit, your pressing the EXIT switch is equivalent to receiving a CANCEL command followed by a PAGE command from the host. CANCEL halts any copy in progress, and discards anything in the host communications input queue. PAGE erases the display list, and resets some graphic attribute defaults. See the command descriptions in the *4510 Programmers Reference Manual* for a complete definition.

NEXT Switch

The NEXT switch advances the switch from port to port to find the port whose parameters you want to examine or change. (The LED by the port under consideration blinks. You use the SELECT switch to select the desired port when its LED is blinking.)

After selecting the port, you use the NEXT switch again to step through an internal list of operator-selectable parameters or parameter values. The codes for these parameters and values appear (blinking) on the STATUS indicator, described later. (When the STATUS indicator displays the desired parameter and value codes, you press the SELECT switch to make the selection. The blinking changes to a steady STATUS display.)

You can also use the NEXT switch to simulate a host command under the following condition: When a port LED is lit, your pressing the NEXT switch is equivalent to receiving a 4010 HARDCOPY host command; it initiates an immediate copy.

MAINS VOLTAGE SELECTOR Switch

The MAINS VOLTAGE SELECTOR switch allows the rasterizer to operate on a line voltage of either 115 or 230 Volts.

REAR PANEL INDICATORS

There are six rear panel indicators:

- The four Port indicators (PORTS 1 through 4)
- The STATUS INDICATOR (two seven-segment digits)
- The VERIF TEST indicator (verification/self test)

NOTE

Since the rear panel indicators and switches interrelate functionally, the operator uses them together. See Section 4 for detailed procedures.

Port Indicators

The port LEDs indicate which port is under consideration at any given time except during a copy session. As you press the NEXT switch repeatedly to advance from port to port, the LED blinks by the port being considered. After you press the SELECT switch, the port indicator glows steadily to indicate readiness for examining or changing the port's communication parameters.

STATUS Indicator

The STATUS INDICATOR (two seven-segment digits) displays communication parameters and error messages. The STATUS INDICATOR displays the parameters in the indicator's left digit zone, and the values in the right digit zone.

As you repeatedly press the NEXT switch to step through (examine) potential selectable parameters or parameter values, the codes of those parameters or values blink on the STATUS INDICATOR. After you press the SELECT switch for the desired parameter code, the flashing STATUS INDICATOR display of that code becomes a steady glow; likewise for the value code. See Section 4 for detailed procedural information and for the description of error messages (codes E1 through E5).

VERIF TEST Indicator

When you press the SELECT switch, the VERIF (verification) TEST indicator starts blinking. This indicates that you activated the rear panel for further tests or to examine or change the communication parameters of one of the four interface ports. When you press the SELECT switch a second time, the LED glows steadily during a series of internal diagnostic tests (see Section 4 for procedure) before further operator action with the NEXT, SELECT, and EXIT switches.

REAR PANEL CONNECTORS

There are six rear panel connectors (refer to Figure 3-1). The connectors are:

- Four 25-pin RS-232-C host interface ports (connectors)
- One 36-pin parallel interface connector (to Color Copier)
- The ac line connector (for power cord)

Input Interface Ports

The four 25-pin RS-232-C interface ports provide the rasterizer with cable connections for multiplexed input from as many as four hosts or terminals. When receiving commands from one interface port, the rasterizer ignores commands from hosts connected to any of the other three interface ports. (The rasterizer does respond with flagging, however, if flagging is set.)

The active interface port remains active (causing the rasterizer to ignore the other interface ports) until the copy session is completed and the port is not reserved.

Output Connector

The rasterizer's 36-pin connector provides cable connection for output to the color graphics copier. The copier processes a copy command from only one interface port at the time.

AC Line Connector

The rasterizer's line connector provides power cord connection to access the power source. To properly set the Mains Voltage Selector switch, refer to the switch's description under "Rear Panel Controls."

Section 4 OPERATION

INTRODUCTION

PURPOSE OF SECTION

This is a reference section which provides the information necessary to operate the 4510 Color Graphics Rasterizer. The information appears under the following captions and in the same order:

- Powering Up the Rasterizer
- Running the Verification Test
- Examining/Changing the Port Parameters
- Setting Split Baud Rates
- Detecting Errors

ASSUMPTIONS

The operational information in this section makes the following three assumptions:

1. The operator has completed the trial run of the "First Time Operation" procedure described in Section 2.
2. The operator is familiar with the controls, indicators, and connectors described in Section 3.
3. The rasterizer is properly installed as described in Appendix B.

POWERING UP THE RASTERIZER

PROCEDURE FOR POWER-UP

1. Power up the host device (or terminal).
2. Power up the rasterizer.

To do this, press the POWER push-button on the rasterizer's front panel. The button shows a green indicator while the rasterizer is ON.

The rasterizer shows flashing lights on its front panel while running several automatic internal tests initiated by power-up. After the satisfactory completion of these automatic tests, the lights turn off. The rasterizer completes more tests (as displayed on the STATUS INDICATOR) after the FAULT light turns off. The rasterizer is now operational.

If the FAULT light changes from flashing to a steady glow, the instrument failed one of its internal tests and needs servicing. (The STATUS INDICATOR shows the applicable error code, provided the rasterizer passes the initial "kernel" tests.) Call a qualified service technician.

3. Power up the color graphics copier.

This completes the power-up sequence for the rasterizer and the host-copier system.

Table 4-1 summarizes the LED indications for the normal operating states of the rasterizer, including the power-up self-test and the more comprehensive Verification Test (discussed next). The chart does not include the FAULT indicator.

Table 4-1
LED INDICATIONS FOR NORMAL OPERATING STATES

State	BUSY/XMIT COPY	VERIF TEST	STATUS INDICATOR	PORT	RECEIVE
Copy in Progress: Host Transmitting	X			X	X
Rasterizer Computing	X			X	
Output to Copier	flashing			X	
Copy Complete				X	
Idle		X			
Power-up Test	X	X	X		
Verification Test	X	X	X		
Service Test	X	X	X		

RUNNING THE VERIFICATION TEST

Although the rasterizer automatically runs several internal diagnostic tests every time you apply power to the rasterizer, you can also run a Verification Test program that initiates several, more comprehensive, tests in addition to the automatic power-up test. Run this Verification Test any time you suspect a problem in the rasterizer's operation. If any test fails (due to a rasterizer malfunction), the **FAULT** light turns on and the rear panel **STATUS INDICATOR** displays an error code.

CAUTION

When you run the Verification Test, the rasterizer should be powered up but idle (not processing any data from a host). Do not start the test while copy is in progress or while the rasterizer is receiving data from the host.

PROCEDURE

1. Press the **SELECT** switch on the rasterizer's rear panel (see Figure 4-1). The "VERIF TEST" LED starts blinking to indicate rear panel activation for further tests or for operator action, and the **BUSY** LED comes on.
2. Press the **SELECT** switch again. The rasterizer immediately starts a series of internal diagnostic tests. As each test runs, the code number for that test appears on the **STATUS INDICATOR**. If a test fails due to a rasterizer problem, the **FAULT** light turns on and the **STATUS INDICATOR** displays the code for the failed test (to aid the service technician in troubleshooting). Refer to the *4510 Service Manual* for full descriptions of the test codes.

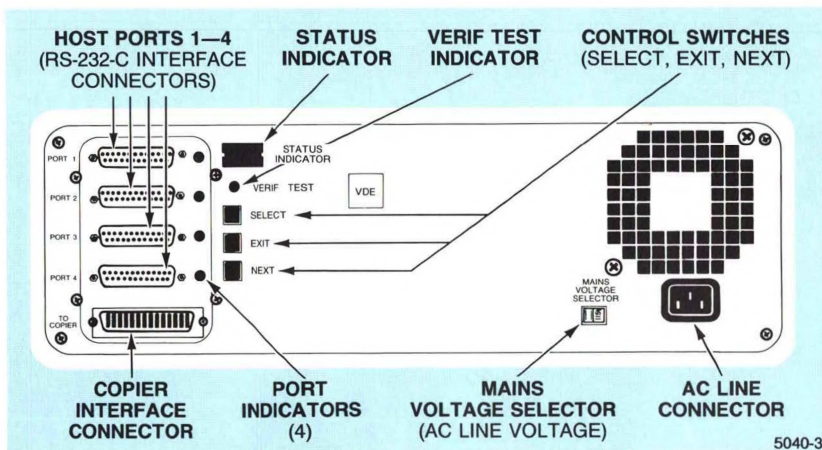


Figure 4-1. Rear Panel Control and Indicator Locations.

The Verification Test runs 4.5 minutes or more, depending on which memory option resides in the rasterizer. If the test does not complete it cycles within this approximate time, an internal test may have failed without being able to light the FAULT LED. However, the STATUS INDICATOR still would display the code of the failed test.

When the Verification Test is complete (with no errors), the STATUS INDICATOR and BUSY LED turn off and the VERIF TEST LED turns on solid. The rasterizer is then ready for further operation.

EXAMINING/CHANGING THE PORT PARAMETERS

PARAMETER DESCRIPTIONS

The rasterizer has four RS-232-C host/terminal interface ports. Each of these ports allows the rasterizer to connect to and interface with a different host or terminal. Because each host or terminal's operating protocol may differ from the others, the rasterizer allows the operator to select different parameters (as needed) for each interface port. This allows rasterizer communication with a wide variety of hosts or terminals.

The descriptions of these selectable parameters appear under the following captions, and in the same order:

- Baud Rate
- Parity
- Flagging
- Stop Bits

Baud Rate

This parameter allows selection of data transfer rates of 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, and 19200 baud. The rasterizer can be operated with "split baud rates" in which the receive and transmit data rates are different (for example, receive at 2400 baud and transmit at 9600 baud).

Parity

Many host systems use the eighth bit of every ASCII character as a parity bit (error check). Parity features include:

- No Parity — but the most significant bit of each ASCII character is set to zero (0).
- Odd Parity.
- Even Parity.
- High Parity — the most significant bit of each ASCII character is set to one (1).

NOTE

The rasterizer does not check parity. The parity features accommodate those hosts that require some form of parity when they receive data. The rasterizer RS-232 port ignores parity in characters it receives.

Flagging

Software flagging (DC1/DC3 Flagging mode) prevents inadvertent loss of host-generated data due to rasterizer input buffer overflow. If THE DC1/DC3 Flagging mode parameter is selected, the rasterizer sends the DC3 (stop) ASCII control character D_3 to the host when the input buffer has filled up or the rasterizer is processing some of the previously received data.

Later, when the rasterizer has processed enough data so that space is again available in the buffer, the rasterizer sends the DC1 (start) ASCII control character D_1 to the host. The DC1 character tells the host that it can send more data to the rasterizer until the rasterizer sends another DC3 character (flag) to stop the host again.

Available selections include no flagging (not recommended for rasterizer operation), flagging on receiving data only, flagging on transmitted data only (also not recommended for rasterizer operation), and flagging on both received and transmitted data (highly recommended).

NOTE

Because of the amount of processing and the relatively slow speeds of attached copiers, flagging is necessary on at least the received data to prevent loss of data. If flagging is not selected, data received from a host while the rasterizer is processing or sending data to the copier can be ignored and lost.

You can enable DC1/DC3 Flagging mode in one of two ways:

- Select the DC1/DC3 Flagging parameter with the rear panel switches (see “Parameter Selection” in this section).
- Use the host-generated SET FLAGGING MODE command.

Hardware flagging (DTR/CTS Flagging mode) signals the host by sending a false on the DTR RS-232-C control line to stop data transmission when the buffer becomes nearly full. When the rasterizer has processed all of the commands so that space is available, the rasterizer signals a true on the DTR control line to the host to allow the host to begin transmitting data again.

In DTR/CTS Flagging mode, the host input/output port must be able to stop data transmission without data loss whenever it detects a false on the DTR control line. The host port must also be able to restart data transmission whenever it detects a true on the DTR control line.

Stop Bits

This parameter selects the number of RS-232-C stop bits that the rasterizer transmits. It should be set to conform to system (host) requirements. The choice is either one or two stop bits.

PARAMETER SELECTION

Each one of the rasterizer's four RS-232-C interface ports can use a different combination of the four parameter values to communicate with the host or terminal connected to that port. We recommend that each port on the rasterizer be set to match the host or terminal connected to that port. (You may have to refer to the host or terminal manual to determine what parameter value settings should be used on each of the rasterizer's four interface ports.)

Table 4-2 shows all of the communication parameter values available in the rasterizer.

NOTE

Unless you operate the rasterizer with split baud rates (that is, with different receive and transmit baud rates), parameter code 0 is not displayed when you use NEXT to examine the baud rate parameter. The first parameter code to appear (when you press NEXT) is 1, which sets the transmit and receive baud rates at the same value.

Table 4-2
PARAMETER AND VALUE CODES

Parameter (left digit of STATUS INDICATOR)	Parameter Value (right digit of STATUS INDICATOR)	Description
0 (See the discussion in this section regarding "Setting Split Baud Rates.")		Transmit Baud Rate (only when Split-Mode is chosen)
	0	External Transmit Clock
	1	75 Baud
	2	110
	3	134.5
	4	150
	5	300
	6	600
	7	1200
	8	1800
	9	2400
	A	4800
	C	9600
	E	19200
1		Transmit/Receive Baud Rate (or Receive Baud Rate when Split-Mode is chosen)
	0	External Receive Clock
	1	75 Baud
	2	110
	3	134.5
	4	150
	5	300
	6	600
	7	1200
	8	1800
	9	2400
	A	4800
	C ^b	9600
	E	19200
2	0 ^b	Parity No Parity: MSB ^a always 0
	1	Odd Parity
	2	Even Parity
	3	High Parity: MSB ^a always 1
3	0	Flagging No Flagging
	1 ^b	DC1/DC3 Flagging: Receive
	2	DC1/DC3 Flagging: Transmit
	3	DC1/DC3 Flagging: Bidirectional
	4	DTR/CTS Flagging
4	1 ^b	Stop Bits One Stop Bit
	2	Two Stop Bits

^a Most Significant Bit.

^b Factory set parameter.

PROCEDURES FOR EXAMINING/CHANGING PORT PARAMETERS

To Examine an Interface Port

1. Press the SELECT switch on the rasterizer rear panel (see Figure 4-1). The VERIF TEST LED starts blinking, indicating that the rear panel is activated for further tests or operator action.
2. Press the NEXT switch once. The VERIF TEST LED turns off and the LED next to the PORT 1 interface connector (see Figure 4-1) starts blinking.

NOTE

If you wish to examine any of the other three ports (2 through 4) at this time, repeatedly press the NEXT switch until the LED next to the desired port interface connector turns on. If you should accidentally go past the desired port interface, continue pressing the NEXT switch until the LED next to the desired port interface turns on again. Then continue with the rest of this procedure since the same procedure applies to any of the four interface ports.

To Examine the Baud Rate Parameter

When the LED next to the desired interface port is lit, press the SELECT switch. This informs the processor that you wish to check or change the communications parameters associated with that port (in this case, PORT 1).

Notice that the left digit of the STATUS INDICATOR begins to blink the parameter code of 1, which is the Transmit/Receive Baud Rate parameter (see Table 4-2).

If the rasterizer is operating with a split baud rate (that is, with different transmit and receive data rates — see “Setting Split Baud Rates” later in this section), then the left digit of the STATUS INDICATOR blinks the parameter code “0” for Transmit Baud Rate or “1” for Receive Baud Rate.

NOTE

If you wish to examine any of the other three parameters (2 through 4) for PORT 1, repeatedly press the NEXT switch until the STATUS INDICATOR's left digit blinks the code of the parameter you wish to examine, per Table 4-2. If you should accidentally pass the desired parameter, repeatedly press the NEXT switch until the desired parameter code shows again.

Changing the Baud Rate Parameter Value

1. While the left digit is blinking "1", press SELECT.
2. Repeatedly press NEXT until the desired baud rate parameter value code (see Table 4-2) appears blinking in the right digit of the STATUS INDICATOR. If you should accidentally go past the desired parameter value, continue pressing the NEXT switch until the desired parameter value code is again displayed in the right digit of the STATUS INDICATOR.
3. Press the SELECT switch. The right digit of the STATUS INDICATOR (parameter value) stops blinking (indicating that the processor accepted the selection) and the left digit of the STATUS INDICATOR starts blinking (indicating that you can reselect this parameter or go on to another parameter).

To Change Parity, Flagging, or Stop Bits Parameters

1. Press the NEXT switch enough times to cause the left digit of the STATUS INDICATOR to advance to the desired parameter code, according to the following codes:
 - 2 = Parity
 - 3 = Flagging
 - 4 = Stop Bits
2. Press the SELECT switch while the left digit is blinking the desired parameter code. You will notice that the right digit of the STATUS INDICATOR begins to blink and the left digit stops blinking. The value displayed will be the current code (parameter value) set in the rasterizer for that interface port (or the factory set value for new instruments).

To Examine Parameters of Other Ports

To examine the parameters for PORT 2, 3, or 4, press EXIT to complete the current port, then repeat the "Procedures for Examining/Changing Port Parameters" for the desired port, parameters, and values.

If no more interface port examinations or parameter changes are desired, press EXIT to save (in NVRAM) all of the current parameter settings for that port, and to enable the rasterizer to process data from a host (or terminal) to a copier. All parameters are saved in memory even if the power is removed from the rasterizer.

SETTING SPLIT BAUD RATES

You can set the rasterizer to receive and transmit data at different rates (that is, set split baud rates). For example, you can program any interface port to receive data at 9600 baud and transmit data at only 2400 baud.

The procedures that follow enable you to set split baud rates for any interface port.

ACCESSING THE TRANSMIT BAUD RATE

1. Press the SELECT switch (located on the rasterizer's rear panel – see Figure 4-1). The VERIF TEST LED will start blinking indicating that the rear panel is activated for further tests or operator action.
2. Press the NEXT switch once for PORT 1, twice for PORT 2, three times for PORT 3, or four times for PORT 4. The VERIF TEST LED will turn off and the LED next to the desired interface port connector (see Figure 4-1) will turn on. If you accidentally go past the desired interface port, repeatedly press the NEXT switch until the LED next to the desired interface port turns on.
3. When the LED next to the desired interface port is lit, press the SELECT switch. This informs the processor that you want to examine or change the communications parameters associated with that port.

Notice that the left digit of the STATUS INDICATOR begins to blink. Unless the rasterizer is operating with a split baud rate, the left digit of the STATUS INDICATOR shows the parameter code of 1 to indicate the transmit/receive baud rate (see Table 4-2) for that port.

4. Press *both* the SELECT and the NEXT switches *simultaneously*. The left digit of the STATUS INDICATOR then displays a blinking zero (0) to indicate the transmit (only) baud rate (see Table 4-2). The right digit of the STATUS INDICATOR displays the parameter value code of the current transmit baud rate set in the rasterizer for that port. (This displayed value would be the factory set value for new instruments.)

If you want to change the Transmit Baud Rate parameter value for this interface port, go to the next procedure entitled "Changing the Transmit Baud Rate."

If you do NOT want to change the Transmit Baud Rate parameter value but want to examine the rest of the parameters for this port, press SELECT. The displayed value is always saved. The right digit of the STATUS INDICATOR *stops* blinking (indicating that the processor accepted the parameter value selection) and the left digit of the STATUS INDICATOR *starts* blinking (indicating that you can reselect this parameter or go on to another parameter).

If you do not want to examine or change any other parameters, press EXIT.

CHANGING THE TRANSMIT BAUD RATE

1. Repeatedly press NEXT until the desired transmit baud rate parameter value code (see Table 4-2) appears blinking in the right digit of the STATUS INDICATOR.

If you should accidentally go past the desired parameter value, continue pressing the NEXT switch until the desired parameter value code is displayed again in the right digit of the STATUS INDICATOR. Then, press the SELECT switch. The right digit of the STATUS INDICATOR (parameter value) stops blinking (indicating that the processor accepted the selection) and the left digit of the STATUS INDICATOR starts blinking (indicating that you can reselect this parameter or go on to another parameter).

2. Press the NEXT switch once. The left digit of the STATUS INDICATOR will advance to the next parameter (blinking). In this case the next parameter code is 1, Receive Baud Rate (see Table 4-2). The right digit of the STATUS INDICATOR indicates the current Receive Baud Rate code (parameter value) set in the rasterizer for that interface port (or the factory set value for new instruments).

If you want to change the Receive Baud Rate parameter value for this interface port, go to the procedure entitled "Changing the Receive Baud Rate."

If you do NOT want to change the Receive Baud Rate parameter value selection but want to examine the rest of the parameters for this port, press the SELECT switch. The displayed value is always saved. The right digit of the STATUS INDICATOR (parameter value) stops blinking (indicating that the processor accepted the selection) and the left digit of the STATUS INDICATOR starts blinking (indicating that you can reselect this parameter or go on to another parameter).

If you do not want to examine or change any other parameters, press EXIT.

CHANGING THE RECEIVE BAUD RATE

1. Press the NEXT switch repeatedly until the desired Receive Baud Rate parameter value code (see Table 4-2) appears blinking in the right digit of the STATUS INDICATOR.

If you should accidentally go past the desired parameter value, repeatedly press NEXT until the right digit of the STATUS INDICATOR displays again the desired parameter value code.

2. Press the SELECT switch. The right digit of the STATUS INDICATOR (parameter value) stops blinking (indicating that the processor accepted the selection) and the left digit of the STATUS INDICATOR starts blinking (indicating that you can reselect this parameter or go on to another parameter).

If you want to examine or change other parameters in this port, refer in this section to an earlier procedure entitled "To Change Parity, Flagging, or Stop Bits." If you want to examine or change parameters for any other port, return in this section to "Procedures for Examining/Changing Port Parameters" (but ignore initial Steps 1 and 2).

If no more interface port examinations or parameter changes are desired, press EXIT to save (in NVRAM) all of the current parameter settings for that port, and to enable the rasterizer to process data from a host (or terminal) to a copier. All parameters are saved in memory even if the power is removed from the rasterizer.

GETTING OUT OF SPLIT BAUD RATE MODE

If you no longer want the Transmit Baud Rate to differ from the Receive Baud Rate, set the baud rates to an identical setting (that is, to one Transmit/Receive Baud Rate) for that port.

DETECTING ERRORS

ERROR CODES

When the rasterizer detects an error, it displays the error on the rear panel's two-digit STATUS INDICATOR. Each error the rasterizer detects has an error code. The paragraphs that follow list each error code and give an explanation of the cause.

NOTE

Each time the rasterizer is powered-up and also when it has been left idle and unreserved for over four hours, the rasterizer automatically goes through an internal self-test routine which tests most of its internal electrical circuitry. These detected errors, which prevent the rasterizer from being used further, are displayed on the rear panel STATUS INDICATOR (along with a front panel FAULT light). This document does not describe these error codes. Refer to the 4510 Service Manual or consult with a local Tektronix Field Office.

E0 and E1. Input Communications Overflow. Normally, when using flagging, the system prevents host communication overflows. However, if the host ignores flagging, a communications overflow may occur and data may be lost. With this error, the rasterizer turns on the front panel FAULT light and displays the error code E1 on the rear panel STATUS INDICATOR. The lights are turned off with the reception of the first character of the next image.

E2. Copier Not Present. If the copier is not connected to the rasterizer and the host begins to send an image to the rasterizer, the rasterizer does the following:

- Turns on the front panel FAULT light.
- Displays error code E2 on the rear panel STATUS INDICATOR.
- Waits for you to attach the copier.

If the host sends enough data to fill the input buffer, the rasterizer flags out the host (provided flagging is selected). When the copier is attached, the FAULT and STATUS INDICATOR lights are turned off and the host is unflagged. The rasterizer will not respond to "report commands" (REPORT TERMINAL SETTINGS and REPORT COLOR HARD COPY STATUS) while waiting for the copier.

E3. Copier Faulted. If the copier develops an electrical problem, is out of ink or paper, or has a paper misfeed, the rasterizer displays the front panel FAULT light and the error code E3 on the rear panel STATUS INDICATOR.

If the copier problem (for example, paper misfeed) occurs before the rasterizer starts converting the display list into raster data, the copy process is automatically retried when the fault clears on the copier.

If the copier problem (for example, a pulled plug) occurs during the copy process, the conversion of the display list into raster data terminates. The conversion process can be reattempted with a second HARDCOPY command after the copier fault clears, provided another image has not been sent to the rasterizer; or you could press the NEXT switch after clearing the copier fault. The FAULT and STATUS INDICATOR lights are turned off when the copier fault clears. While waiting for the copier fault to clear, the rasterizer does not respond to "report commands," namely REPORT TERMINAL SETTINGS and REPORT COLOR HARD COPY STATUS.

E4. End of Graphics Display List Memory. If the rasterizer's display list should overflow, the rasterizer automatically issues itself a HARDCOPY command and the partial image is sent to the copier. The front panel FAULT light turns on and E4 is displayed on the rear panel STATUS INDICATOR. The host is flagged out (if flagging is selected) while the rasterizer is converting the partial image and sending it to the copier. After the copier produces the partial image, the rasterizer unflags the copier, clears the partial display list, and then can receive the remainder of the image. The front and rear panel error indicators are turned off when the rasterizer receives the first character of the next portion of the image.

Incomplete images might not be drawn correctly. The object that is being defined when the overflow occurs might be truncated.

E5. Internal Error. If the rasterizer's processor should misread its own internal software program, the rasterizer would perform a complete reset (which causes all data to be lost) and cease lighting the front panel FAULT LED. The rasterizer's rear panel STATUS INDICATOR would display error message E5.

This type of an error requires the operator to recycle the power on the rasterizer and retransmit the image from the host to the rasterizer. Please report to Tektronix this kind of error and the conditions of its occurrence.

Appendix A

OPTIONS AND ACCESSORIES

OPTIONS

The Display List Memory Options and the Power Cord Options shown in Tables A-1 and A-2 are available to customers, and should be specified when ordering the TEKTRONIX 4510 Color Graphics Rasterizer.

Table A-1
DISPLAY LIST OPTIONS

Option	Memory Size	Vector Capacity (Approximate)
30	128k bytes	12,000 vectors
31	512k bytes	50,000 vectors
32	2M bytes	200,000 vectors

Table A-2
POWER CORD OPTIONS

Option	Power Cord Description
A1	European Power Cable (220 V)
A2	United Kingdom Cable (240 V)
A3	Australian Power Cable (240 V)
A4 ^a	N. American Power Cable (240 V)
A5	Swiss Power Cable (240 V)

^a The standard configuration is North American (120V)

ACCESSORIES

Tektronix ships with the 4510 the standard accessories listed in Table A-3 (no extra charge), whereas the optional accessories in Table A-4 are orderable items at a nominal cost.

Table A-3
STANDARD ACCESSORIES

Accessory Description	Tektronix Part No.
Power Cord (depending on option selected: A1, A2, A3, A4, or A5)	Refer to Table A-2
4510 Operators Manual	070-5040-00
RS-232 Host Port Cable	012-0911-00

Table A-4
OPTIONAL ACCESSORIES

Accessory Description	Tektronix Part No.
4510 Reference Guide	070-5041-00
4510 Service Manual	070-5042-00
4510 Programmers Reference Manual	070-5043-00
RS-232 Loop-back Connector: testing	013-0193-00
Parallel Interface Cable (3 meters)	012-0518-00
Parallel Interface Cable (9 meters)	012-0527-00
Parallel Interface Test Cable Assy	067-1215-00

Appendix B

UNPACKING AND INSTALLATION

INTRODUCTION

This appendix contains the following procedures to use when your 4510 Color Graphics Rasterizer arrives from the factory:

- Unpacking the Rasterizer
- Setting Up the Rasterizer

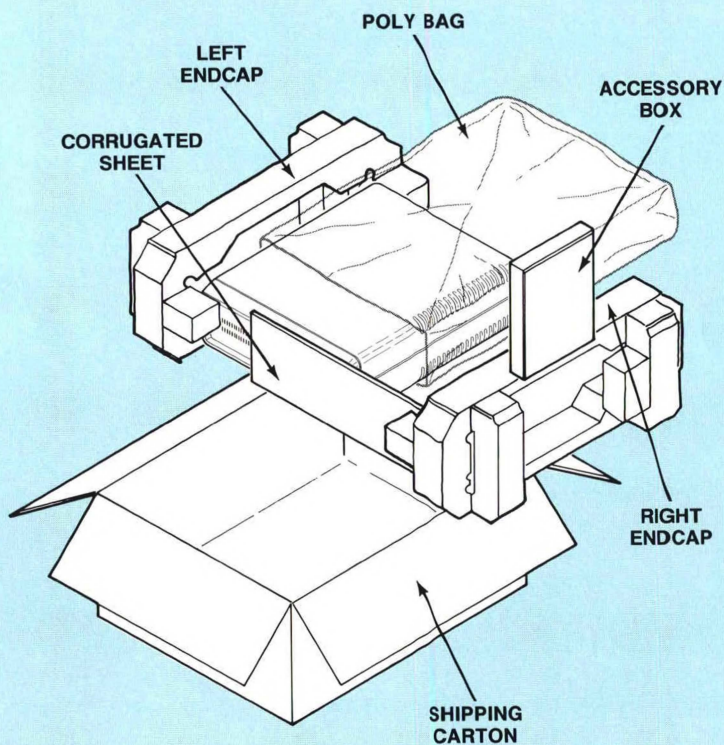
UNPACKING THE RASTERIZER

When unpacking the rasterizer, follow these procedures and suggestions:

NOTE

Before starting the unpacking procedure, carefully inspect the carton for any signs of damage. Report any damage to the carrier and to your Tektronix sales representative immediately.

1. Place unopened carton (23.5 lbs) on an appropriate work space to unpack the 4510 Color Graphics Rasterizer and accessories.
2. Carefully use a knife or cutter to cut the sealing tape that binds the carton's top flaps; then open the box.
3. Remove the accessory box from the side of the rasterizer (see Figure B-1), and open box to remove the accessories.
4. Carefully lift the rasterizer out of the shipping carton, and place the instrument on a safe work space.
5. Remove the rasterizer from the poly bag that envelops it.
6. Check the packing list against your received goods to verify that you have the rasterizer's standard accessories (see Appendix A) plus any optional accessories ordered.
7. Now you are ready to install the rasterizer. Do the following procedures.



5040-4

Figure B-1. Packaging Assemblies.

SETTING UP THE RASTERIZER

The installation process includes these procedures, in this order:

- Connecting the ac Power
- Connecting the Port Interface Cables
- Connecting the Copier Interface Cable

The installing technician should refer to power-up and self-test procedures in Section 4 after completing the set-up procedures in this appendix.

CONNECTING THE AC POWER

1. Check MAINS VOLTAGE SELECTOR switch on rasterizer back panel to ensure correct voltage selection.



If the rasterizer is not set for the proper operating voltage, and the rasterizer is connected to a voltage different from that of its MAINS VOLTAGE SELECTOR switch setting, serious damage to the rasterizer may occur.

2. Plug female connector of supplied power cord into 3-pronged line connector on rasterizer rear panel (see Figure 3-1).
3. Plug male connector of power cord into an ac power source.

CONNECTING THE PORT INTERFACE CABLES

The rasterizer is configured with DTE (male) RS-232 ports and a male/female interface cable. The four 25-pin RS-232-C ports on the rasterizer's rear panel (see Figure 3-1) provide cable connections for multiplexed input from as many as four hosts or terminals. Figures B-2, B-3, and B-4 show some typical host-rasterizer configurations. The ports are arranged so that no one port has priority over another: the first to receive valid communications from a host (or terminal) becomes the active interface port.

Connect the port interface cables as follows:

1. Check that the rasterizer's power switch is turned off.
2. Plug the female connector of the RS-232 interface port cable into the selected port receptacle (PORT 1 ,2, 3, or 4) on the rasterizer rear panel.
3. Plug the loose male end of the interface port cable (step 2) into the RS-232 receptacle of a modem or host. A terminal connection may require a null-modem (see Figure B-5).
4. This completes the interface cable connection to provide input from the one host or terminal to the rasterizer. To connect other hosts or terminals to the three other ports available for multiplexed input, repeat Steps 1 through 3.

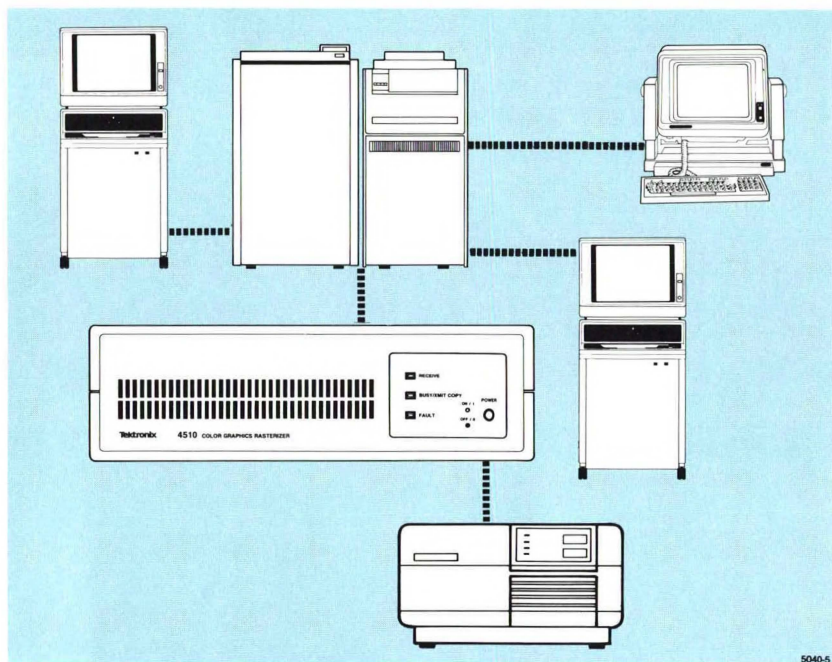
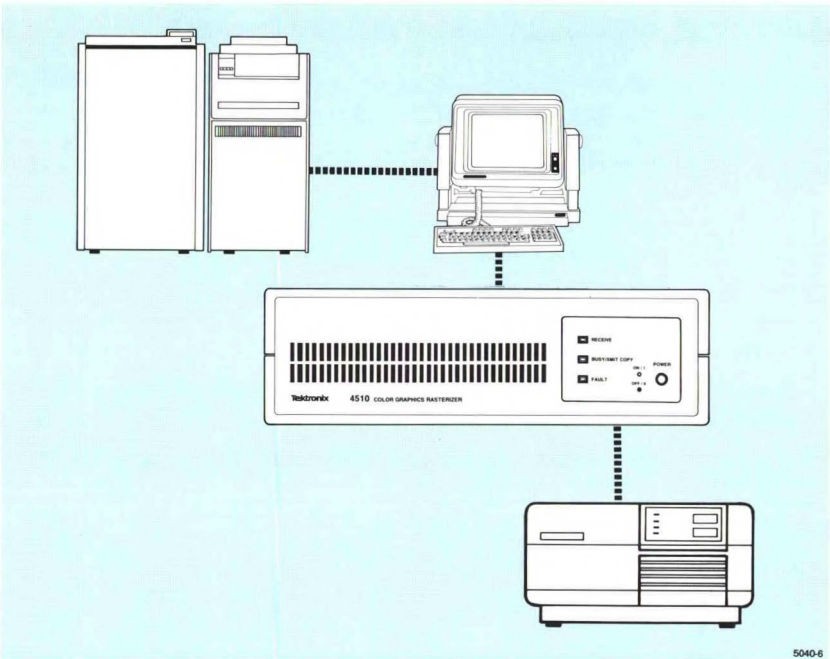
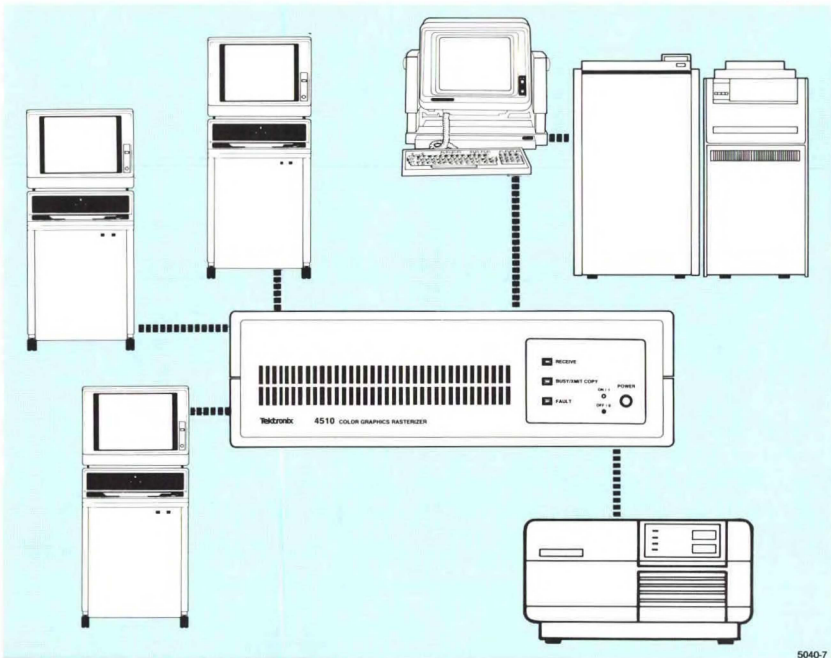


Figure B-2. A Host (with Terminals) Connected to a Rasterizer.



5040-6

Figure B-3. A Host Connected to the Rasterizer via a Terminal (Set for Loop- Thru Mode).



5040-7

Figure B-4. Several Hosts/Terminals Connected to the Rasterizer.

CONNECTING THE COLOR COPIER INTERFACE CABLE

The rasterizer's 36-pin connector (on rear panel) provides cable connection for output to the color graphics copier. Install the copier interface cable as follows:

1. Check that the rasterizer and copier are turned off.
2. Plug one end of the copier interface cable into the 36-pin receptacle (labeled "To Copier") on the rasterizer rear panel. Snap the connector wire loops into place to secure the cable connector to the receptacle.
3. Plug the other (loose) end of the copier interface cable (of step 2) into the 36-pin receptacle of the copier. Screw the cable connector's two strain-relief screws into the threaded holes of the copier connector.
4. This completes the copier interface cable connection to provide output from the rasterizer to the copier.

Now that the rasterizer is interconnected to the copier and the host or terminal, you are ready to apply power and run self tests.

Turn to Section 4 and do these procedures:

- Powering Up the Rasterizer
- Running the Verification Test

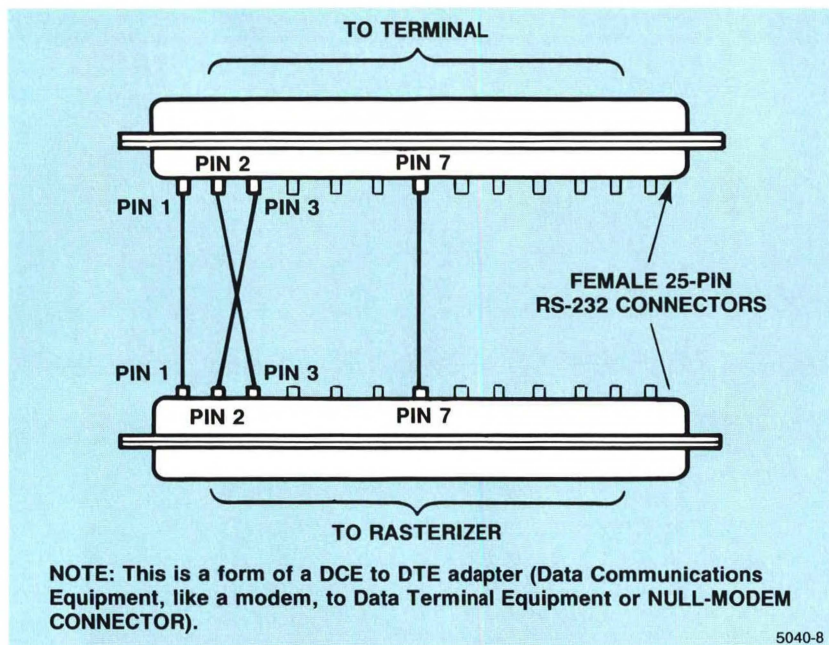


Figure B-5. RS-232-C Adapter to Connect a Terminal to the Rasterizer.

Appendix C

SPECIFICATIONS

The following tables list specifications for the 4510 Color Graphics Rasterizer. The specifications are listed for your information only.

Table C-1
PHYSICAL SPECIFICATION

Characteristic	Specification	Characteristic	Specification
Height	5.5 in (14 cm)	Width	15.9 in (40.4 cm)
Length	18.8 in (47.8 cm)	Weight ^a	15.5 lbs (7.04 Kg) ^a

^a Shipping Weight = 23.5 lbs (10.7 Kg)

Table C-2
ENVIRONMENTAL SPECIFICATION

Characteristic	Specifications
Temperature	–40 to +65° C (non-operating) 0 to +40° C (operating).
Humidity	0 to 90% relative humidity (non-condensing).
Altitude	To 40,000 ft (12192 m) (non-operating). To 10,000 ft (3048 m) (operating).
Vibration	No failures induced by 0 to 0.015 inch displacement, from 5 to 55 Hz in any of the three major axes (operating).
Shock	No failures induced by 30 g's, ½ sine, 11 msec, each axis. (non-operating).
Bench Handling	Non-operating and Operating: With the device operating, one edge can be lifted four inches and then dropped freely to the horizontal desk top. The rasterizer is required not to sustain any damage, not to interrupt its operation, not to lose any data, and not to change its mode of operation as a result of this test.
Packaged Product Vibration and Shock	Vibration: per ASTM D999-75, Method B. Shock: per ASTM D775-61.V.
Electrostatic Immunity	Operating: No interruption of operation, loss of data, or change of operating mode after subjected to 15 kV shock. Non-operating: No damage to the 4510 or no loss of non-volatile storage when subjected to 20 kV shock.
Immunity from Line Transients and Line Dropouts	Susceptibility and Vulnerability: Unidirectional Wave: 1.5 kV, per Table 6.2 in Tektronix standard 062-2875-00 Ring Wave: 4 kV, per Table 6.2 in Tektronix standard 062-2875-00.

Table C-3
ELECTRICAL SPECIFICATION

Characteristic	Specification
Input Power	120 W maximum, 60 W typical.
Line Voltage	115 or 220 volts nominal. Line voltages are selectable to select 87 to 128 V, or 174 to 250 V.
Line Frequency	48 to 66 Hz.
Line Fuse	1.2 amp (slow-blow).

SAFETY

The 4510 Color Graphics Rasterizer complies with the following safety standards:

- UL 478, 5th Edition, Information Processing and Business Equipment
- CSA Standard C22.2 No. 154-1983, Data-Processing Equipment
- IEC 380, Safety of Business Machines
- IEC 435, Safety of Data-Processing Equipment
- German VDE, British Telecom and Australian Telecom (satisfied by compliance with IEC 380 and 435)

Table C-4
PERFORMANCE CHARACTERISTICS

Characteristic	Specification
Resolution (output)	Viewport up to 2048 × 4096 pixels. (Depends on copier resolution, media size, and copy orientation.).
Addressability (input)	Up to 4096 × 4096 points. This is the same 4096 × 4096 "terminal space" as used in the TEKTRONIX 4100 Series terminals. Smaller window normally is copied. Default window 4095 × 3132.
Graphic command syntax	TEKTRONIX 4100 compatible, including PLOT 10.
Line types	Solid and dashed lines; wide lines (vectors only).
Graphic primitives	Vectors, polygons (panels), rectangles, markers, text characters.
Number of colors	7 solid colors and 274,617 dither colors to total 274,625 distinct colors and color patterns.
Interface type (input)	4-Chanel Multiplexed Modular RS-232 interface.
Interface type (output)	469X Parallel Interface.
Vector capacity	12,000 to 200,000 vectors.
Bit map depth	Three bits per pixel storage.
Output size function	U.S. copy sizes A and B and metric copy sizes A4 and A3 will be automatically sensed from the copier.
Image orientation function	Portrait and landscape image orientation is selectable.
Display list limitations	Only one image will be buffered at a time. The entire image must be received before rasterization can start.
Multiplexer limitations	Only one input channel can be serviced at a time; other channels will be flagged. No data will be lost, in case of flagging (if flagging is selected).
Functionality limitations	Each image is taken at a given orientation, window, and copier size. Multiple copies are all of the same orientation, window, and copier size. Corners of wide lines are not mitered. No transforming of segments.
Additional functionality	Multiple copies of the same image require only one display list load.

Appendix D

COMMAND SUMMARY

4100-STYLE COMMANDS BY FUNCTION

The escape sequence commands listed in this summary are grouped by functions, as follows:

- General Control Commands
- Communication Commands
- Graphics Environment Commands
- Text Commands
- Marker Commands
- Line Commands
- Panel Commands
- Rectangle Commands
- Report Commands
- Hardcopy Commands

GENERAL CONTROL COMMANDS

Descriptive Name	Opcode
CANCEL	E _c KC
RESET	E _c KV

COMMUNICATION COMMANDS

Descriptive Name	Opcode
CRLF	E _c KR
IGNORE DELETES	E _c KI
LFCR	E _c KF
SAVE NONVOLATILE PARAMETERS	E _c KU
SET BAUD RATES	E _c NR
SET BYPASS CANCEL CHARACTER	E _c NU
SET EOL STRING	E _c NT
SET FLAGGING MODE	E _c NF
SET PARITY	E _c NP
SET STOP BITS	E _c NB
SET TRANSMIT DELAY	E _c ND

GRAPHICS ENVIRONMENT COMMANDS

Descriptive Name	Opcode
PAGE	E _c FF
SET BACKGROUND COLOR	E _c TB
SET COLOR MODE	E _c TM
SET IMAGE ORIENTATION	E _c QO
SET SURFACE COLOR MAP	E _c TG
SET VIEW ATTRIBUTES	E _c RA
SET WINDOW	E _c RW

TEXT COMMANDS

Descriptive Name	Opcode
ENABLE DIALOG AREA	E _c KA
ENTER ALPHA MODE	U _s
GRAPHIC TEXT	E _c LT
SELECT CHARACTER SET	(G0) E _c (
	(G1) E _c)
SET ALPHATEXT FONT	(G0) E _c S _i
	(G1) E _c S _o
SET CHARACTER PATH	E _c MN
SET GRAPHTEXT FONT	E _c MF
SET GRAPHTEXT PRECISION	E _c MQ
SET GRAPHTEXT ROTATION	E _c MR
SET GRAPHTEXT SIZE	E _c MC
SET GRAPHTEXT SLANT	E _c MA
SET TEXT INDEX	E _c MT

MARKER COMMANDS

Descriptive Name	Opcode
DRAW MARKER	E _c LH
ENTER MARKER MODE	F _s
SET MARKER TYPE	E _c MM

LINE COMMANDS

Descriptive Name	Opcode
------------------	--------

DRAW	E_cLG
ENTER VECTOR MODE	G_s
MOVE	E_cLF
SET LINE INDEX	E_cML
SET LINE STYLE	E_cMV
SET LINE WIDTH	E_cMW
SET 4014 LINE STYLE	E_c' through E_{co}

PANEL COMMANDS

Descriptive Name	Opcode
------------------	--------

BEGIN PANEL BOUNDARY	E_cLP
END PANEL	E_cLE
SELECT FILL PATTERN	E_cMP

RECTANGLE COMMANDS

Descriptive Name	Opcode
------------------	--------

DRAW RECTANGLE	E_cUR
SET DRAW BOUNDARY MODE	E_cUB

REPORT COMMANDS

Descriptive Name	Opcode
------------------	--------

REPORT COLOR HARD COPY STATUS	E_cQQ
REPORT TERMINAL SETTINGS	E_cIQ

HARDCOPY COMMANDS

Descriptive Name	Opcode
------------------	--------

4010 HARDCOPY	E_cEB
HARDCOPY	E_cKH
RESERVE COPIER	E_cQR
SET NUMBER OF COPIES	E_cQN

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